SOCIO - ECONOMIC STUDY OF PRAWN FARMERS IN ERNAKULAM DISTRICT

Dissertation submitted by Kum BEENA K. B. in partial fulfilment for the Degree of Master of Science (Mariculture) of the Cochin University of Science and Technology

December 1992

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ICAR

Post-Graduate Programme in Mariculture
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C E R T I F I C A T E

This is to Certify that this Dissertation is a bonafide record of the work done by KUM. BEENA K.B. under my supervision and that no part thereof has been presented before for any other degree.

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C O N T E N T S

P R E F A C E

There is a need to utilise rich and varied resources in the field of capture and culture fisheries in India. On one hand it will provide cheap source of protein to the consumers and earn foreign exchange and on the other hand poor coastal population will be benefitted by way of raising their family income. Government of India has been attaching great importance to the fisheries in the new agricultural policy and an enhanced outlay of over Rs 400 crore has been earmarked for the fisheries development in Eighth Five Year Plan. Besides this, states and Union Territories will make suitable increase in their allocations in the centrally sponsored fisheries schemes.

India has the distinction of being the seventh largest producer of fish in the world. Our earning from export of marine products has increased to Rs 1375 crores in 1991-1992. This is mainly due to the increased production through aquaculture in brackish waters. Among the few species of finfishes and shellfish culture in India, prawn culture has a very significant place. The basic economic level of aquaculturists is low. Because of socio-economic constraints, inadequate use of inputs like feed, seed, pesticides and fertilizer, and due to limitation of capital only subsistence production is observed.

The major socio-economic constraints encountered in the way of development of aquaculture are,

(1) Low technical and managerial knowhow.

(2) Limitation of resources availability.

(3) Low financial capabilities and

(4) Low bargaining position in marketing their yield.

In south west and east coasts of India a great deal of interest is generated in improving the extensive culture of prawn. A well conducted socio-economic survey of prawn farmers will generate information on economic feasibility of prawn culture besides revealing their economic level and living conditions which have direct impact on production. Since different states vary in their natural and man power resources, microlevel studies at district level will be of more help in the planning process of designing aquaculture development schemes for the state and the nation.

The socio-economic improvement of farmers is the primary objective of all fishery development schemes. Coastal villages in Ernakulam District are still backward and farming of naturally available shrimp resources by simply trapping them has to some extent improved the living conditions of these people through income generation. This traditional method of culture, if modified by careful management practices like stocking of a definite number and desirable species, providing supplementary feed and

proper pond preparation methods has proved to be of immense advantage to the farmers resulting in higher profit margin, increased production and income generation.

In Vypeen island of Ernakulam District where prawn farming is one of the important activities there are about seven coastal villages which have a total of 229 farms registered in Fisheries Office. According to the records maintained there, the following break-up was obtained:

No.	Name of the Coastal Village	No of farms
1	Puduvypu	3
2	Elankunnapuzha	18
3	Narakkal	41
4	Nayarambalam	88
5	Edavanakkad	53
6	Kuzhupilly	17
7	Pallipuram	9
		229

Besides this, marginal farmers who do prawn farming in small canals leased out to them for a period of five months by the landlords are found in a good number, especially in Narakkal, among whom the technology transfer project has been initiated by the KVK of the Central Marine Fisheries Research Institute, Cochin.

The present study is confined to Narakkal village, covering a large number of farms of different sizes to compare and analyse the relative advantages of scientific prawn farming in terms of the betterment of their socio-economic conditions and general standards of living. Only through a well planned and well conducted socio-economic survey, the problems faced by the farmers in field conditions and also the extent of implementation of innovations in culture techniques and the comparitive advantages of these practices could be analysed. Though such surveys were held previously it is imperative to hold fresh surveys on a large scale to provide basic and recent information on the economic feasibility of the existing technology and to correct imbalances in resource allocation and utilisation if it exists. The future developmental plans could then be geared up in an user based direction from the results obtained, from the data collected through the present survey.

I express my deepest sense of gratitude to Shri. D.B.S. Sehara Scientist, SG, C.M.F.R.I., my project supervisor for his valuable guidance in devising the schedules and his constant encouragement throughout the study period. I am grateful to Dr P.S.B.R.James, Director, C.M.F.R.I, for providing the opportunity and facilities to conduct this work. I also wish to thank Shri.Mohanan and Dr. M.M.Thomas of K.V.K. Narakkal who helped me to conduct the survey. The timely help offered by

Mrs.Krishna Srinath, Scientist-SG, in data collection and Shri K.K.P.Panikkar, Scientist-SG and Shri Sathiadas, Scientist-SG for going through this manuscript and their valuable suggestions are also deeply acknowledged. I also thank Shri M.Srinath, Scientist-SG for his help in the computer analysis. My sincere thanks are also due to Shri Shaji of CIBA and Smt Shalini of C.M.F.R.I. whose help is deeply acknowledged. The excellent co-operation of the prawn farmers in the survey area is also appreciated. I wish to express my thanks to all my classmates for their encouragement, advice and help at various occasions. Sincere thanks to Shri D.Sathiajith for the immense help offered throughout the survey period. To the I.C.A.R., I express my gratitude for awarding me with the fellowship that assisted in the successful completion of my study.

I N T R O D U C T I O N

In the recent past more and more interest has been shown in aquaculture on a world wide basis. In some countries aquaculture is recognised as an important and fast growing economic sector as compared to capture fisheries. Many governments have felt the need of restructuring their national policies and plans to give due emphasis to aquaculture. For the last three decades many policy makers and development agencies have been found talking in terms of the potential of aquaculture and the need to develop a technology to support its realisation. But, proportionately a matching hardcash outlay is not coming forth for the implementation of the plans. It is true that technology is needed to support development, growth and expansion of aquaculture, but existing and known technology should be quickly capitalised upon while simultaneously working on the new technology. In addition, efforts should be made to fully utilize the existing water areas suitable for aquaculture. In this context "traditional" is equated to mean less productive and less efficient (but not necessarily uneconomic or unprofitable). Thus the modernisation push with advanced technology and modern inputs aims at quickly and greatly increasing per unit productivity through cultivation intensification.

After more than three decades of such developmental work, still, poverty, unemployment, malnutrition, low-living standards and inequalities in income persist

among the fisher-folk. There is a general belief that technological improvement can overcome low yields and other production constraints. Socio-economic aspects have not so far been given due weightage in the process of aquaculture development. In the technological approach, biotechnological work is rather straight forward and less complex than human subjects. The success of the technological approach is very much associated with socially desirable actions or responses.

The technology oriented approach for aquaculture development further becomes less effective or uncertain in getting benefits to small farmers and rural people because of the higher level of investment and more constraints in physical terms. Due to socio-economic constraints these small farmers in coastal areas are not able to take advantage of such opportunities inspite of Government assistance in many cases. Thus, the development of aquaculture mainly depends on the socio-economic aspects of the farmers and the impact of aquaculture is examined from the point of view of aquaculture affecting people and their welfare. In many cases it is very difficult for less educated small farmers to purchase and use costly imputs such as feed, fertilizer, pesticides etc which results in low yield and consequently in low income. Benefits of these traditional aquaculture decreases as population increases and the natural environmental conditions are exploited. Because of the poor performance

of aquaculture no accurate picture of the potential employment is drawn. Poverty and indebtedness in the rural areas are very common and wide spread especially among marginal and small farmers which inhibit them in applying required inputs for farming. The meagre income has to be divided between house-hold and initial capital investment. Too often, after meeting these needs there is hardly any money left for operational expenses. In such cases, role of lending agencies become more important in financing the marginal and small farmers.

Tenancy problems and land reforms are seldom studied with reference to aquaculture. Landlord-tenant contracts and leasing system directly affect the development of aquaculture especially in case of marginal farms. The labour exploitation by the landlords are still existing.

In recent past aquaculture has been recognised as an important economic activity in India which has a vast stretch of coastal land for farming endowed with rich natural prawn seed resources. We have an estimated 1.7 million ha of cultivable brackishwater area in the coastal sector of which only 30,000 hectares are being used for prawn and fish farming in the coastal belts of Kerala, Karnataka and West Bengal (Silas, 1983). Universel taste, high unit value, short duration of crop, quick return of investment, persistent demand and fast expanding market, apart from the dwindling and poor capture returns from the shelf waters due to over

exploitation, are major attractions to take up shrimp culture in the coastal inlets. Moreover, shrimp production has steadily increased and in 1990, contribution of cultured prawns was about 25% of total prawn production of 2.6 million tons (Anon.1991)

According to the nature of management and input use, four types of shrimp farming systems are prevailing viz - traditional, extensive, semi-intensive and intensive. The traditional way of shrimp farming consists in trapping seeds during high tide when the ponds get inundated where they are held for a few months till they attain the market size. This type of prawn farming is practised in low lying areas or paddy fields of Kerala. (Panikkar (1937), Menon (1954), Gopinath (1956), Panikkar and Menon (1956), Kurian and Sebastian (1982), Muthu et al (1982) have given a general account of these practices of prawn culture. However, due to indiscriminate stocking, predation, free entry of undesirable species etc, the average production from such a system is poor, usually below 0.5 tonnes/ ha /annum (MPEDA, 1992). The extensive system is an improved traditional farming involving construction of ponds ranging from 1 to 5 ha with selective stocking of desirable species though at a comparitively lower density. The average production under this system ranges from 1 to 1.5 tonnes / ha / crop. In semi-intensive system selective stocking is done with fast growing hatchery reared seeds at a

higher density ranging from 1 to 3 lakh/ha. The average production under this system ranges from 4 to 5 tonnes/ha/crop. In intensive system selective stocking of quality seeds at a density of 10 lakhs per ha is done with a production of 10 to 20 tonnes/ha/crop. (MPEDA, 1992).

In Kerala, 65,000 ha of brackish water are is estimated for culture of which only 20% is under prawn farming with an annual production of 8925 tonnes of shrimps which contributes to 25% of the national total production of 35,500 tonnes (ADAK Survey Report 1991). A traditional system of prawn farming in paddy fields (Pokkali fields) popularly known as prawn filtration is prevalent in more than 4,500 hectares of low-lying coastal brackish water fields adjoining the Vembanad lake in Kerala State (Muthu, 1978). These fields varying in size from less than 0.5 ha to more than 10 ha and lying along the coastal villages of Trichur, Ernakulam, Alleppey and Kottayam Districts are confluent with the Vembanad lake through canals and are subjected to tidal influence (George, 1983).

In Ernakulam District where there is a large number of prawn farms, the Central and State Government agencies have been vigorously encouraging scientific prawn farming which reduces the risk of low production. Improved operational practices like selection of desirable

species, nursery rearing, supplementary feeding, pond preparation which include elimination of predators, uneconomic species and weeds, manuring etc and culturing the stocked prawns for 3-4 months till they attain marketable size, is the scientific method of prawn farming (Silas, 1983). This method of prawn culture has been demonstrated by Central Marine Fisheries Research Institute and is being propagated among the farmers mainly through the Krishi Vigyan Kendra. It has also been demonstrated that not only increased quantity but also improved quality of product is assured to obtain higher unit price (George, 1983) Traditional prawn farming in the Vypeen island of Kerala is carried out in two types of ecosystems namely, seasonal fields and perennial fields (M.M.Thomas and Saji Chacko, 1991) Thus at present most of these culture methods are giving way to innovations in culture techniques.

The ultimate goal in the development of aquaculture aims at removal of poverty, malnutrition, attainment of self-reliance and employment generation among the coastal people (Sehara, Sathiadas, Karbari (1988) and Unnithan (1985). Research on the economics of aquaculture also plays a very significant role in decision making among the farmers and for formulating aquaculture policies by the government. The major steps taken to elaborate aquaculture development include a well conducted economic evaluation and a comparitive

study of different types of management systems that will lead aquaculture development in the right direction (Shang, 1981).

The primary cause for all these developments in shrimp farming falls back on the problems and needs of the prawn farmers. In order to identify them and then to proceed with the need based research projects, a socio-economic survey of existing farms is very important which will provide a basic information about the current status, problems and constraints of shrimp culture in particular, and on policy making on aquaculture in general (Shang, 1981).

The main aim of the study was to analyse the socio-economic condition of the different types of prawn farms namely marginal, small and large. Some of them have adopted innovations in new culture techniques also. Specifically, emphasis has been given to evaluate the socio-economic conditions of the prawn farmers. A parallel study was conducted regarding the income, consumption, employment pattern and credit facilities available to the marine fishermen to analyse and assess the economic conditions.

The socio-economic aspects of prawn farming, the availability of inputs in time at reasonable rates, marketing of the products, availability of credits on soft terms and conditions, improvement in farmers skill, ownership, and other social aspects form the main theme

of the study. The study of farm economics including factor-production relationship, employment and income generation and other farm management practices directly focus on the socio-economic frame work of aquaculture. Practical suggestions for the socio-economic improvement of farmers are indicated in the present study and the results will be significant for future planning of aquaculture development programmes.

MATERIALS AND METHODS

Area of Survey:

The survey area is confined to the coastal village of Narakkal in Ernakulam District, which is distributed in various wards of the potential farming centres, and is indicated in the given map.

Narakkal was selected for survey because most of the farms in that area were the traditional ones which are slowly being converted to the semi-intensive or improved extensive farms by following improved management practices. The impact of improved prawn farming methods on the socio-economic condition of the farmers with respect to the increase in yield, income generation, employment, changes in consumption and expenditure pattern etc were all put under a comparitive scale of studies including farms of different sizes. Since Narakkal has all sizes and types of prawn farms the study was conducted to evaluate the socio-economic conditions of farmers to make a comparative assessment.

The level of production in this region was of the order of 700 - 1000kg/ha which is mainly attributed to the productivity of the area due to the closeness to the barmouth. (George, 1974). But the yield obtained in the area of study was comparitively lower due to several factors like late stocking, pollution in the water bodies, lack of adequate capital to start the

dulture etc.

A keyhole view of Narakkal Panchayat giving details of land area and socio-economic status is furnished below,

Area	-	8.60 Sq Kms
No.of household (Total)	-	3622
(i) SC	-	551
(ii) ST	-	7
Population:-		
(Male)	-	10551
(Female)	-	11121
Total	-	21672
Literacy (Total)	-	79.7%
(Number of Literates)		
(i) SC	-	3234
(ii) ST	-	32

Available amenities

Schools

(i) Higher Secondary	-	2
(ii) Upper Primary	-	2
(iii) Lower Primary	-	4
(iv) Industrial Schools	-	2

Hospitals

(i) Government	-	1
(ii) Private	-	3

Anganvadi - 13

Banks

(i) Nationalised - 1

(ii) Scheduled - 2

Method of Survey

A sample size of 71 was established in the study with 13 marginal, 45 small and 13 large farms taking the following size limitations.

Marginal	- Upto 1 acre
Small	- More than 1 upto 20 acres
Large	- More than 20 acres

The survey was conducted on a random basis and data on the different socio-economic parameters of prawn farming were collected by holding personal interview with the farmers. For this purpose, a questionnaire was prepared, and the format of which is given in the appendix.

Methodology

The terminologies followed in the collection and interpretation of data are described below.

(1) Farmer household:- A household having at least one member engaged in prawn farming. The farm may be owned or leased-in.

(i) Working are group: All members within the age group of thirteen to sixty years.

(ii) Children: Upto 12 years.

(iii) Old: More than 60 years.

(2) Occupation:-

(i) Main:- An occupation contributing more than 50% to the total annual income of the family.

(ii) Subsidiary:- An occupation other than the main occupation.

(3) Education:-

(i)	Primery	- I to IV Standard.
(ii)	Middle	- V to VII Standard.
(iii)	High School	- VII to X Standard.
(iv)	Secondary	- Pre-degree course or Intermediate
(v)	Graduates and above	- Degree holders and above
(vi)	Illiterates and others	- Those knowing only to sign and recognize alphabets of Malayalam. Children below 5 years are also included in this category.

Procedure/Method in estimation of economic parameters followed in data analysis is described below,

(1) Income from farming:- The total value of yield from farming of one crop of prawn for a period of 5-6 months during 1991.

(2) Variable costs:- It includes the cost-price (in Rupees) of the variable inputs like seed, feed and also the wages for hired labour engaged for different operations at farms.

(3) Fixed Costs:- It includes the annual depreciation

on sluice-gate, net and other equipments and lease amounts.

(4) Total operational expenditure:- The total annual variable and fixed cost of farming.

(5) Income from other sources:- Income from subsidiary occupations, like animal husbandry and other jobs.

(6) Total Annual Income:- Income from prawn farming plus the income from other sources in a year.

(7) Annual House-hold consumption:- The amount spent for the various day to day requirements.

(8) Indebtedness:- The loan availed from different sources like bank, societies, money lenders, friends, relatives etc.

Other parameters considered for the evaluation of social status of the house-holds are described below,

(1) Religion and Caste.

(2) Type of House and Rental Value.

(3) Main material possessions in the house.

(4) Membership in Co-operative Societies.

(5) Credit facilities available.

(6) Constraints and general problems.

An analysis of variance (ANOVA) was used to find out the differences between the three categories of families for different parameters like farm income, inputs, consumption indebtedness, stocking density, yield and farm size. Correlations were also calculated for the above cited parameters.

Like most of the cropping system production from prawn farming also behaves under the law of diminishing returns. When the use of one particular increases keeping all other inputs constant, the mpp increases to certain limit and then diminishes. The production goes on increasing to a maximum level after which it declines. Thus a limit is to be found out where marginal cost equals to marginal revenue earned from prawn farming.

To estimate production elasticities of various inputs of production, farm wise data was fitted to a Cobb-Douglas type of junction.

$$Y = a\, X_1^{b1} \cdot X_2^{b2}$$

Where, x_1 = Cost of seed (Rs)

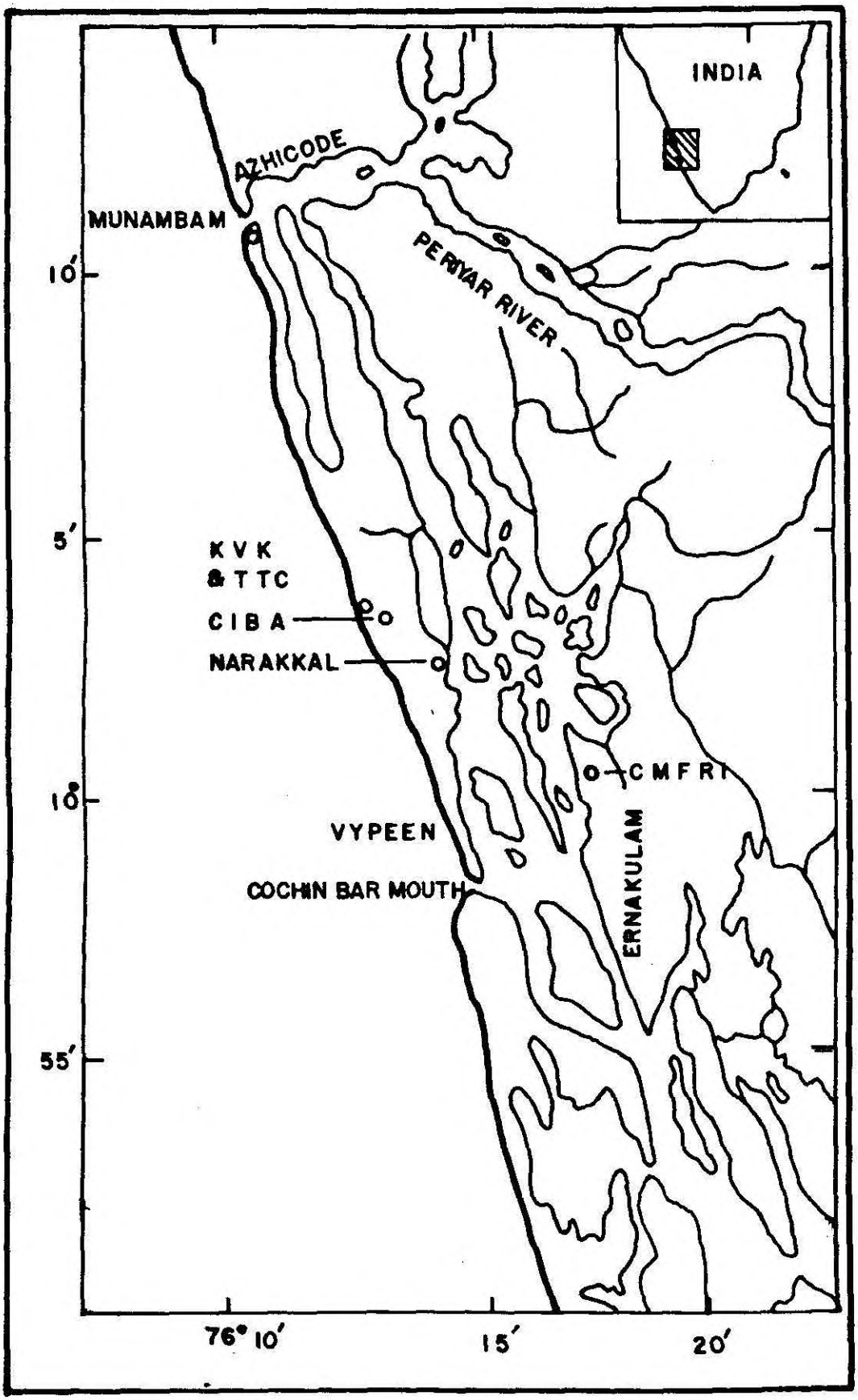
x_2 = Labour charge (Rs)

Y = Income earned from Prawn Farming (Rs)

a = Intercept.

b_1 and b_2 are production elasticities of X_1 and X_2 (in terms of value) respectively.

With the help of above mentioned regression analysis, the optimum level of use of the input could be worked out and the level of production generating maximum profit could be arrived by equating the acquisition oost of factors of production to the respective marginal value products.



Map showing the area of study

RESULTS AND DISCUSSIONS

PRAWN CULTURE PRACTICE

Prawn farming is carried out mainly by semi-improved extensive and traditional methods at Narakkal. The adoption of scientific methods have been initiated at a few farms recently. Improved method includes selective stocking of prawns, feeding them with supplementary feed, fertilization of the pond, eradication of weeds, predators etc. In India, a production of the order 1500-2000 kg/ha is realised through semi-intensive farming (Muthu et al (1982). In Kerala the low-lying brackish water fields have been extensively utilised for farming by both selective stocking and tidal filtration methods.

In Narakkal where this survey was conducted, prawn farming is carried out in seasonal ponds though year -round culture is limited to some areas of Vypeen Island. The prawn culture is usually done during the pre-monsoon months (November to April). During South-West Monsoon (June to September) the salinity in these fields decreases and almost fresh-water conditions prevail which is not suitable for growing the marine prawns. In the perennial fields there is availability of salt-water throughout the year where two crops are

realised annually. In the seasonal fields, during the South-West Monsoon period, a salt-water tolerant variety of paddy called "Pokkali" is grown (Silas,1978) The productivity of the seasonal and perennial fields have been studied by earlier workers like George (1980).

For the present study, based on the size of the farms, three categories were established viz, marginal, small and large farms with respective size limits of, upto 1 acre, more than 1 acre upto 20 acres and more than 20 acres. All the marginal farms in the sample were seasonal farms while some of the small farms were perennial ones and the rest of the farms, both small and large were seasonal. After the paddy harvest, these seasonal holdings were leased out to prawn farmers for a period of five months. The capital investment, operational expenditure, profit realised, marketing and other details like house-hold consumption pattern, family particulars, literacy etc. are all included and studied under the various socio-economic parameters of prawn farming, the results of which are discussed below:-

(1) Demography of the area

Livelihoods of people in Narakkal area mainly depends on paddy cultivation, fishing, growing coconuts

and prawn farming. Narakkal is a narrow stretch of coastal land and is a part of Vypeen Island. It is one of the most thickly populated area with a limited scope of natural resources except the potential for expanding aquaculture. Since the sea has been exploited for fishing upto a great extent and further scope of exploiting capture fishery is limited, there is an ample scope of utilising low lying areas through practicing aquaculture on scientific basis.

The people at Narakkal area are by and large poor. Majority of the population belongs to socially and economically backward communities. The social and economic backwardness coupled with lack of natural resources hinders the future prospects of economic activity. Further lack of industrialisation, low status of education, and increasing pressure of population of the island further aggravate the problems in this area. For decades together, pokkali fields have been used to grow rice for about 6 months and shrimp culture during the rest of the year. The prawn culture is followed almost in a traditional way. Because of the poor socio-economic status and lack of knowledge and adoption of scientific culture practices, the shrimp production has been found low. Since the socio-economic

characteristics directly influence the attitude for adopting innovations, the survey covering these parameters has been conducted by interviewing marginal, small and large farm families.

(2) Family Particulars

Among the marginal farmers the Male-Female ratio is 4:5. Of total population the working population is 53%. Among working population, Male-Female ratio is 6:7. The old persons with more than 60 years of age form about 20% of the population, whereas children (below 12 years) are about 27%. The average family size in this group is 7.7. The following table gives the characteristics of population.

Marginal Farmers

Sample size = 13.

Farm size = upto 1 acres

Sex-wise distribution of Family members

Item	Total Family Members	Working Age Group		Children		Old		Total	
		Males	Females	M	F	M	F	M	F
No.	92	23	26	9	16	9	9	41	51
Male Female Ratio		1:1.1		1:1.7		1:1		1:1.2	
% of total population	100	25	28	9.8	17.4	9.8	9.8	44.6	55.4

Family size = 7.7

Dependent ratio - Adults : Others = 1:0.87

In a sample size of 45 families of small farmers, the family size is 5.5. The working population is 53% whereas the percentage of the children and the old persons is 30% and 17% respectively. Of total members males and females are 57% and 43% respectively. Interstingly, in all the three age groups, the male population exceeds the female population which is contrary to the trend in Kerala State.

Small Farmers

Sample size = 45

Farm size = More than 1 acre upto 20 acres

Sex-wise distribution of family members.

Item	Total Family Members	Working age Group		Children		Old		Total	
		Males	Females	M	F	M	F	M	F
No.	246	71	59	45	28	24	19	140	106
Male Female Ratio		1:0.83		1:0.62		1:0.79		1:0.76	
% of total population	100	28.9	24	18.3	11.4	9.8	7.7	57	43.1

Family size = 5.5

Dependent ratio - Adults : others = 1:0.89

A sample of 13 Prawn farming families owning large farmers has been surveyed which has a farm of more than 20 acres each. Of total 73 family members, 58% comes under the working age group. Population of old persons is 15% and the rest comes under the age group of 'below 12 years'. The ratio of males to females is 3:2. The average family size is worked out at 5.6 in this group.

Large farmers

Sample size = 13

Farm size = More than 20 acres

Sex-wise distribution of family members

Item	Total Family Members	Working age Group		Children		Old		Total	
		Males	Females	M	F	M	F	M	F
No.	73	24	18	12	8	8	3	44	29
Male Female Ratio		1:0.75		1:0.66		1:0.38		1:0.66	
% of total population	100	32.9	24.7	16.4	11	11	4.1	60.3	39.7

Average Family size = 5.6

Dependent ratio = Adults : Others = 1:0.74

3. Educational Status

In the category of marginal farmers, about 1/5th of the population consists of both children below the age of school-going and those who cannot read and write. About 15% of the population is possessing higher secondary and above educational qualification and the majority of the rest has less than high school qualification.

Literacy level among marginal farmers

Particulars	Illiterates & others	Primary	Middle	High	Secondary	Graduates & above	Total
No	20	16	16	25	13	1	91
%	21.6	16.3	17.4	26.1	14.1	1.1	100

Among small farmers about 6% comes under the category of graduate and post-graduates. The percentages of those who have passed primary, Middle, High School and Higher Secondary is 10, 17, 38 and 20 respectively. Those knowing only to sign and recognize alphabets of Malayalam and also the children below five years of age together form 9% of the population in this group.

Literacy level among small farmers

Particulars	Illite-rates & others	Prima-ry	Middle	High	Secon-dary	Gradu-ates & above	Total
No	20	26	42	92	52	14	246
%	8.20	10.26	17.2	37.70	20.90	5.74	100

On large farms, in the population of 73, 12% persons are primary pass, 23% Middle , 38% High School, 16% Higher Secondary and 1% Graduates & above qualification. One-tenth of the population does not have any educational qualification.

Literacy level among large farmers

Particulars	Illite-rates & others	Prima-ry	Middle	High	Second-ary	Gradu-ates & above	Total
No	6	9	17	28	12	1	73
%	8.2	12.3	23.3	38.4	16.4	1.4	100

4. Type of House

Most of the dwellings under the category of marginal farmers are Kutcha houses. Majority of the houses is a set of one room and a kitchen. Most of the house have the separate enclosures for bathrooms and toilets.

No. of houses	Type	Average rental value per month (Rs.)
13	Kutcha	350/-
Nil	Pukka	NA

More than 1/3rd of the houses occupied by small farmers are having Kutcha/pukka walls and thatched roof, and the remaining are pukka houses. The average rental value of the houses is about Rs.500/- per month. Each house consists of one or two rooms with a provision of latrine and bathroom outside the house.

No. of houses	Type	Average rental value per month (Rs.)
16	Kutcha	500/-
29	Pukka	

In the category of large farms about 80% families have pukka houses and the remaining kutcha houses. The average rental value has been worked out at Rs. 650 per month.

No. of houses	Type	Average rental value per month (Rs.)
3	Kutcha	650/-
10	Pukka	

5. Material possessions:-

The marginal farmers are having very limited luxury items. The water and electric connections are yet to be provided to their houses. The material possession mainly includes cheaper type of furniture, valued at about Rs. 1,000/- per family.

Small farmers are fairly equipped with the items like television, refrigerator, radio and furniture. In certain pockets of the surveyed area, there is no provision of electricity. The average value of the house hold items is calculated at Rs. 15,250/- per family.

The position of large farmers can be safely equated with the small farmers. Though gross income for the large farmers is more than that of the small farmers but the profit per unit of farm area is comparatively lesser.

During survey, none of the farm families reported about any sort of insurance of house hold items.

6. Occupation:-

The marginal farmers do not own water-holdings for prawn culture. All of them have taken water-bodies on lease, paying at the rate of about Rs. 10,000/- per hectare. Their main occupation includes agriculture, animal husbandry

and private/Government jobs. For about five months, they are involved in prawn farming, which earns them 25% of their total annual income.

Small prawn farmers earn their livelihood, mainly by shrimp culture. About 15% of their total annual income comes from other occupations.

In case of large farms, subsidiary occupations contribute only 8% to the annual income. Almost in all cases, farms are fully owned by the prawn-culturists.

About 1/3rd of the families coming under the category of small farmers have also taken water-bodies on lease. The lease amount depends on the location, size and the productivity of the farms. Among the subsidiary occupations fishing forms an important source of income. Generally animal husbandry is taken up at subsistence level. A few number of birds forming poultry and duckery are maintained on almost all types of farms but the products are generally consumed by the family members. Thus, whereas the small and large farmers mainly depend on prawn farming, the marginal farmers have prawn farming as the subsidiary occupation.

7. Credit details:-

In Narakkal area, the prawn farmers are getting loan from different sources like HDFC, Co-operative societies,

Commercial Banks, Matsyafed, Private Prawn buyers, Friends, Money lenders and relatives. Some of these agencies give loans for a specific purposes but others especially private agencies, give loan for various purposes the farmers need.

The interest rate varies from 15% to 20% on the loan available from institutional agencies. The private money-lenders charge an interest rate varying from 24% to 60% per annum, depending on the need of the farmers and risk involved in recovery of loan. Majority of the fish merchants who are purchasing prawns charge nominal interest or no interest from the farmers but they make sure that the product is sold to them by the prawn farmers. Price realised on such type of sales is a little less than the market price.

The present study reveals that higher the income of a group of farmers more is the loan availed by that group. The average loan availed by the marginal farmers amounts to Rs. 8,500/- per family.

In case of small farmers and large farmers, the loan taken from different agencies is found to be about Rs. 20,000/- and Rs. 25,000/- respectively.

The frequency table for the loan availed by the different types of farms, as shown below, reveals that 4 out of 13 marginal families availed loan upto Rs.5,000/-, and the remaining between Rs.5,001 and Rs. 15,000.

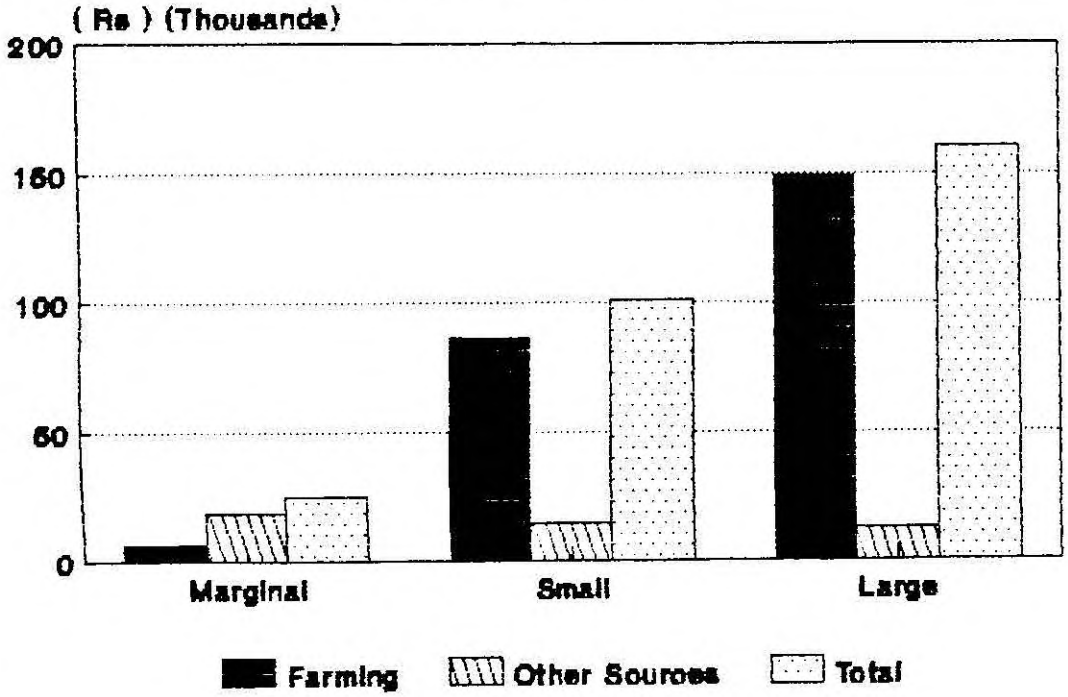
Loan (Rs.)	Numbers of Families		
	Marginal	Small	Large
Upto 5000	4	8	1
5001 - 15,000	9	16	4
15001 - 25,000		9	2
25001 - 35,000		6	2
35001 - 50,000		3	3
more than 50,000		3	1

In case of small farmers in a sample of 45 families, 18% availed loan upto Rs. 5000; 36% between Rs. 5001 and Rs.15,000; 20% between Rs. 15,000 and Rs. 25,000; 13% between 25,001 and Rs. 35,000; and 7% each between Rs.35,001 and Rs.50,000 and more than Rs.50,000. In a sample of 13 large farms, one family is indebted upto Rs. 5,000, four families between Rs. 5001 and Rs.15,000, two families between Rs. 15,001 and Rs. 25,000, 2 families between Rs. 25,001 to Rs.35,000, 3 families between Rs. 35,001 to Rs.50,000 and one family more than Rs. 50,000. The analysis of variance on indebtedness between different families show significant variation - as seen from ANOVA table No. 6.

8. Income

The total annual gross income of the marginal farmers is worked out at Rs.24,761/-. Since the farm area for prawn

Income from various sources

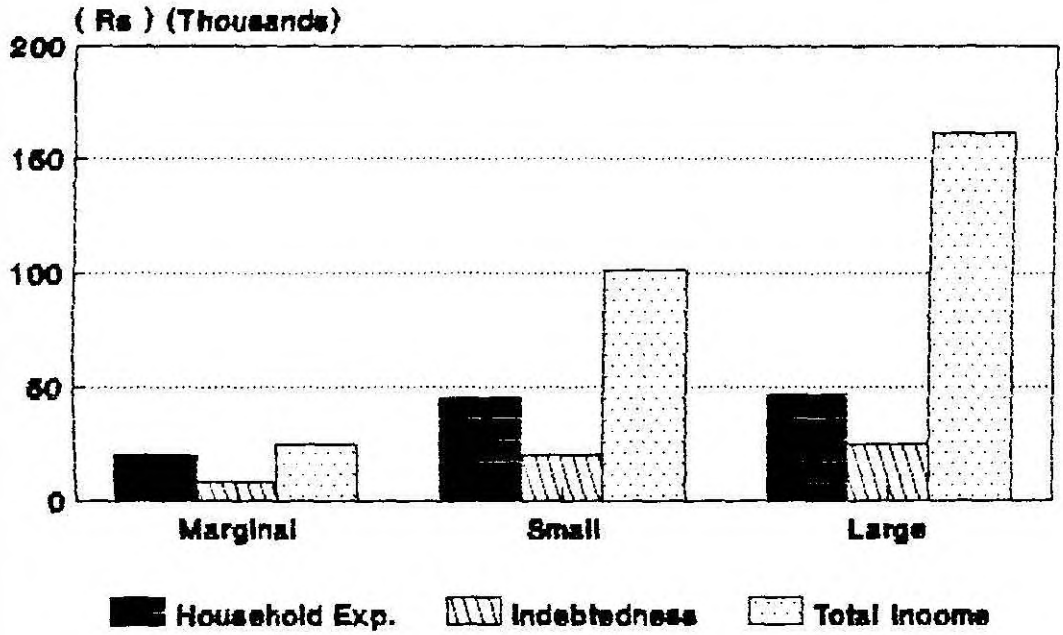


culture is only 0.53 acres, the income from prawn farm is about Rs. 6,140/- per family. For small farm, annual income from all sources comes about Rs. 1,00,000/- which includes Rs. 14,000/- from other sources and rest from prawn farming. Similarly, the gross income for large farms averages at Rs. 1.6 lakh including Rs. 12,000/- from subsidiary occupations. Thus, the prawn farming contributes more than 80% to the gross income in case of smalland large farmers. If the income of all the 71 families is analysed, per family income comes to about Rs. 98,000, out of which more than 80% comes from prawn farming.

9. House-hold expenditure

Almost all the expenditure in a family except investment for future has been categorised. The items like Cereals, pulses, fats, vegetables, egg, meat and fish, sugar, salt and spices, tea and coffee, etc have been clubbed under a head of "Essential consumer items". Second category includes items like clothes, foot weat, education-fees drugs and medicine, refreshment and toilet items (soap, cream, powder, paste etc) which is termed as "Semi-essential items". The third category include "Non-consumable items" like conveyance, services (hair dressing, laundry etc), entertainment (Cinema, toddy etc) and Rents (House, Boat, nets etc).

Total Income House-hold Expenditure and Indebtedness; per family.



Income, Consumption and Indebtedness per farm per year

Type of Farms	Income from farming	Income from other sources	Total Income	House-hold Expenses	Indebt-edness
M	6140.8	18620.6	24761.4	19967.5	8500
S	86777.8	14235.5	101013.3	45187.0	19856
L	148853.8	11884.6	160738.4	46292.0	25077.9

As can be seen from the table, the annual house-hold expenditure comes to Rs. 40,772/family. Of total house-hold expenditure, 53% is incurred on edibles, 21% on semi-essential items and 26% on non-consumable items. The house-hold expenditure, in case of marginal farmers, is worked out at Rs.20,000/annum. For this category the essential consumer items itself account for about 70% of the house-hold expenditure whereas semi-essential items and non-consumable items accounts for 14% and 16% respectively. For small farmers, the average annual house-hold expenditure amounts to Rs.45,187/-of which 46% is incurred on essential items, 28% on semi-essential items and 26% on non-consumable items. In case of large farms, family expenditure is Rs.46,292/-

per annum. Of total amount spent on house-hold items essential items share 45%, semi-essential items 27% and non-consumer items 28%. The house-hold expenditure pattern of different families shows that more is the income, lesser share goes to essential consumable items. In other words, rich families spend more on semi-essential and non-consumable items.

Among marginal farmers, 2 out of 13 families spent upto Rs.10,000 on house-hold items in a year, while 5 upto Rs. 20,000; 4 families upto Rs.30,000 and the remaining 2 upto Rs. 40,000/-.

Among small farm families surveyed at Narakkal the amount incurred on house hold items reached a maximum of above Rs. 60,000 per year and 9 out of 45 families came under this category. Among the rest,9 families spent an amount of Rs.50,001 to Rs. 60,000; 10 families spent Rs. 40,001 to Rs. 50,000; 8 families spent Rs.30,001 to Rs.40,000; 5 families spent Rs. 20,001 to Rs. 30,000; 3 families spent Rs. 10,001 to 20,000 and only one family spent upto Rs. 10,000 per year.

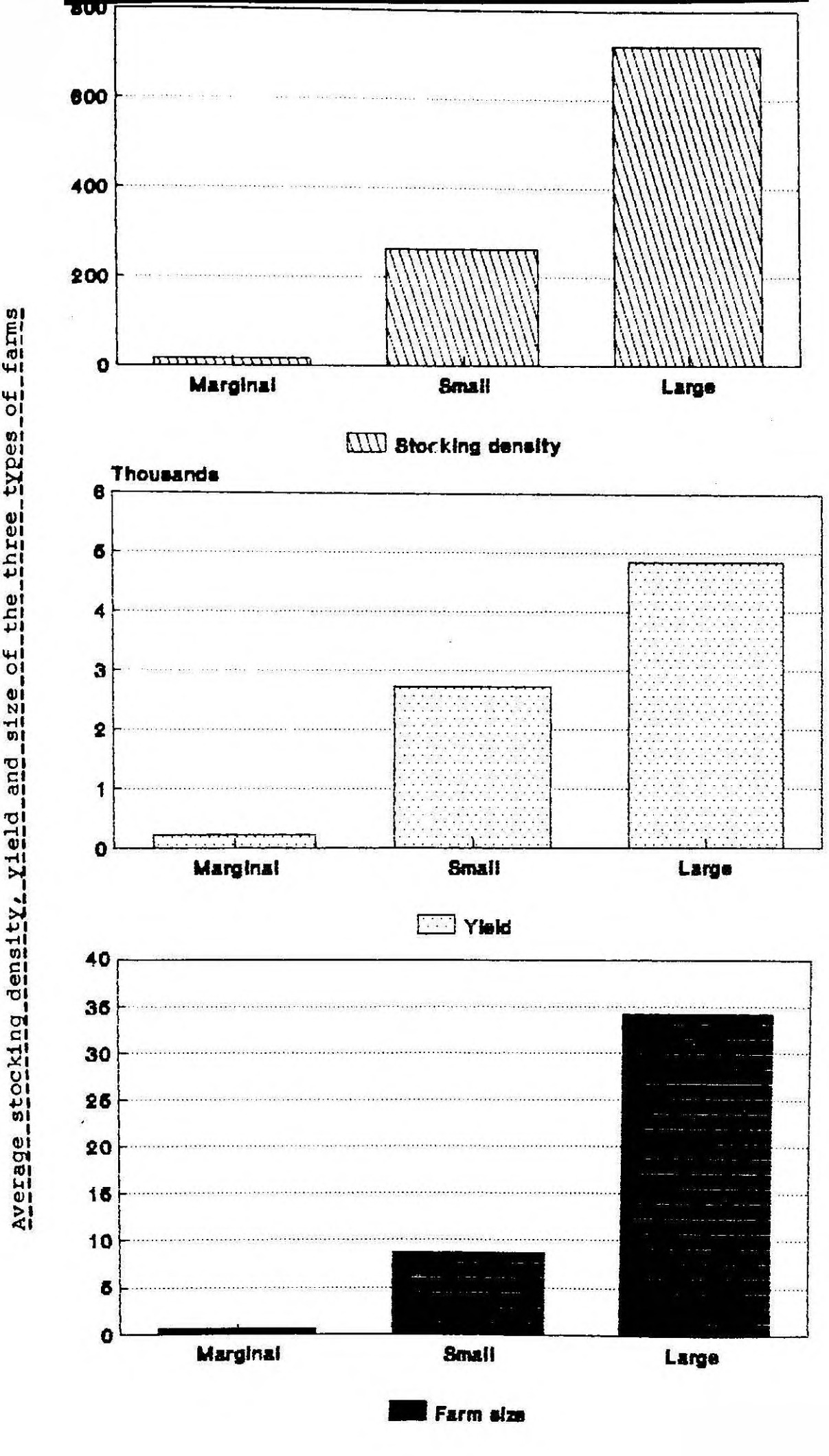
House-hold Expenditure pattern

Amount (Rs.)	Marginal	Small	Large
Upto 10,000	2	1	-
10,001 - 20,000	5	3	1
20,001 - 30,000	4	5	-
30,001 - 40,000	2	8	2
40,001 - 50,000		10	3
50,001 - 60,000		9	5
more than 60,000		9	2

In the case of 13 large farmers all families spent more than Rs. 10,000 per year on house-hold items. One family spent upto Rs. 20,000; 2 families spent upto Rs. 40,000; 3 families upto Rs. 50,000; 5 families upto Rs. 60,000 and only 2 families spent more than Rs. 60,000.

10. Input-Output analysis of Prawn farming:-

The costs and returns of prawn farming have been analysed separately for the three categories. Though there is not much difference between the system adopted for culture on marginal, small and large farms, but stocking density and other inputs used per unit of farm area vary between these farms.


Average stocking density, yield and size of the three types of farms
800
600
400
200
0
Marginal
Small
Large
Stocking density
Thousands
6
5
4
3
2
1
0
Marginal
Small
Large
Yield
40
35
30
25
20
15
10
5
0
Marginal
Small
Large
Farm size

Accordingly area is also noticed as given in table No:s I, II and III.

The farm size distribution has been categorised for different types of farms and presented below. The differences in fam size are significant as seen in ANOVA table No. 7. From the table given below it is seen that 31% of the marginal farm families have less than 0.3 acres of holding. Among remaining three categories 23% each have a holding of 0.3 to 0.5 acres, 0.6 to 0.8 acres and 0.8 to 1 acre.

Marginal Farmers

Farm size Area in acres	more than 0.3	0.3 -0.5	0.6-0.8	more than 0.8 upto 1	Average
No.of Farms	4	3	3	3	0.53

Among the category of small farmers, 36% farms have an area of less than 6 acres, 31% between 6 and 10 acres; 22% between 11 and 15 acres and 11% between 16 and 20 acres.

Small Farmers

Farm size Area (acres)	more than 6	6-10	11-15	16-20	Average
No. of farms	16	14	10	5	8.76

In case of large farmers, in a sample of 13 farms, 3 have less than 25 acres of land area, 4 have between 26 and 30 acres, 2 have between 31 and 40 acres and four have more than 40 acres.

Large Farmers

Farm size Area (acres)	more than 25	26-30	31-40	more than 40	Average
No. of farms	3	v4	2	4	34

11. Cost of production

In Narakkal area majority of the farms surveyed under this study are using inadequate quantities of inputs required per unit of farms area, which is responsible for over all low yield of prawns.

A. Variable costs

a. Seed

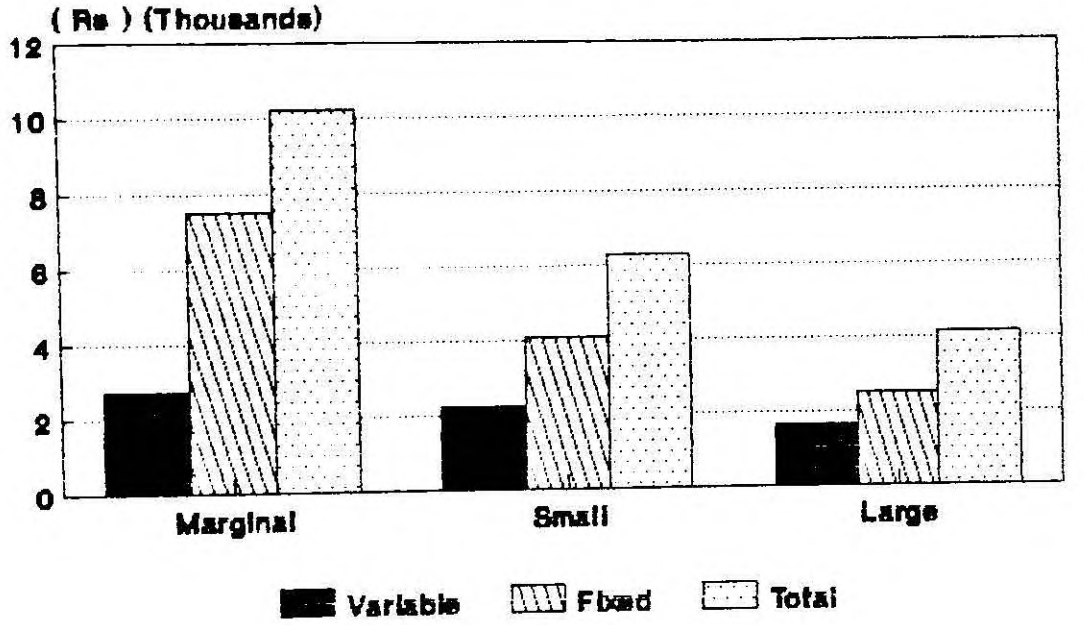
The farms are predominantly seeded for P.indicus. Other varieties cultured in these farms mainly include M.dobsoni, M.monoceros and P.monodon. In some fields stocking is done through tidal filtration whereas in other farms selective

stocking is practiced. The main sources of seed availability are collection centres which collect seeds from wild for different species. The farmers go to collection centres and collect the seeds in polythene bags. The seed rate including transportation cost varies from Rs. 30 to Rs.35 per thousand. The size of the seeds usually varies from 15 to 20 mm and is in the PL-20 stage.

After transportation and seeding in the field the survival rate ranges from 50% to 70%. The average cost per thousand number of seeds is calculated at Rs. 33.11.

The stocking density in marginal farms averaged at 30,842 nos i.e. 16,346 nos/farm of 0.53 acres. The seed cost is found to be Rs.1002.5/acre in these farms. On small farms the stocking density is of a little lesser magnitude. In an acre, 30086 prawn seeds were stocked which cost Rs. 998.4. For an average size of 8.76 acres of farm, the total investment on seed is Rs.8746/-. On large farms an amount of Rs.23921.2 is incurred for an average size of 34.13 acres. The number of seeds stocked per acre of farm area is 21,219, costing Rs.700.9. An average picture of 71 farms shows that an investment of Rs.842 is made for stocking an average number of 25,436 seeds per acre. Thus, it is found that larger the farm, lesser is the stocking density and the amount incurred on seeding per unit of area.

Variable, Fixed and Total Cost of different Prawn Culture farms per acre.



The annexed ANOVA table No.8 shows that a significant difference exists in stocking density betwen the different types of farms.

The cost of seeds also shows significant differences as shown in the ANOVA - table No. 2.

b. Feed

It is found that a limited number of farmers are using feed in their farms at Narakkal. On the surveyed farms, artificial feed was used by hardly 30% of the sample farms and that too in inadequate quantity. The feeds used on these farms include clam meat, tapioca powder, groundnut oil cake and prawn meal. Some of the farmers also use home-made feeds like cooked rice which is usually given for the juveniles in post-larval stage and also for the juveniles in the form of a paste.

On Marginal farms, the amount spent on feed averages Rs.93 per farm only which comes to Rs.175.5 per acre. On small farms, this amount is still lesser i.e. about Rs.25/acre. A mear amount of Rs.60/acre is found to be spent on large farms. Seeing these figures it is felt that the amount spent on feed is very meagre. The average amount spent on feed per acre of farm area is calculated at Rs. 21.32. Taking

Rs. 4 as price of one kg feed the quantity used averages 5.33 kg per acre. It seems that most of the farmers are depending on natural food availability. Similarly, there is hardly any farmer who is using fertilizer and toxicants for eradication of predators among the category of marginal farmers.

The analysis of variance table, given below, reveals that there is nos significant difference in feed cost between three types of farms surveyed under this study. (ANOVA Table No. 3)

c. Labour charges

For calculation of labour charges for prawn culture, imputed value of family labour is added with the paid-up labour charges. An average amount of Rs.40/- is taken as wage for one manday labour. The hired labour is mainly used for preparing the pond before storing the culture, like repair of bunds and fixation of sluice gate and also for harvesting. Family labour is mainly engaged in feeding,maintenance of stock watch and ward etc.

On Marginal farms an amount of Rs. 806.2 has been spent towards labour charges which is averaged at Rs. 1521.7 per acre.

One small and large farms, labour charge per acre is of lower magnitude. The same trend was observed in earlier work done by Shri Jayagopal. Per farm an amount of Rs. 10,631.6/- has been incurred by small farmers on an average farm area of 8.77 acres. In case of large farms, per acre investment on labour comes to Rs. 938.4. Considering all the 71 farms an average amount of Rs. 1071.7 per acre has been incurred on labour. Thus, per acre requirement of labour is worked out at about 27 mandays. Labour costs about Rs. 12,750 per farm. Due care has been taken while calculating the labour charge in terms of kind paid for harvesting. In some of large farms the labour is contracted for a specified period. It is also noticed that food and refreshment for the labourers are met by some farmers which is duly accounted in this analysis.

The differences of labour cost are shown in the ANOVA table No. 4.

d. Total variable cost

The total variable cost for marginal farmers is calculated at Rs.3,699/acre whereas for small and large farmers it comes to Rs.2236.9 and Rs.1655.2/acre respectively. On an average, operational cost is worked out at Rs.1935.2/ acre i.e. Rs. 23,024.7 per farm. More than 50% of the total variable cost is found to be incurred on labour. In case of total variable cost also per acre the amount was the highest for marginal farmers and lowest for large farmers.

B. Fixed costs

The main components of fixed costs in prawn farming include sluice-gate, nets and other equipments and land lease. In case of Marginal farmers, almost all farms are leased in at the rate of about Rs.4000/- per acre. Similarly a few of small farms also have been taken on lease at this rate. In case of large farms almost all farms are owned by the culturists. Depending on the location and productivity of the farm, the lease amount has been varying from Rs. 2000 to Rs.4500 per acre. The life of sluice gate has been considered 3 years whereas for nets and other equipments, it is 2 years. Accordingly the annual depreciation has been calculated which on adding with the land rent forms the annual fixed cost. In case of marginal farms, the annual fixed cost is totalling to Rs.3980 per farm which comes as 7510/ acre. In case of small farms, depreciation and farm rent comes to Rs.3550 and Rs. 32,008/- respectively. Thus an

Income, Expenditure and Net Profit of Prawn Farming in the three farms.

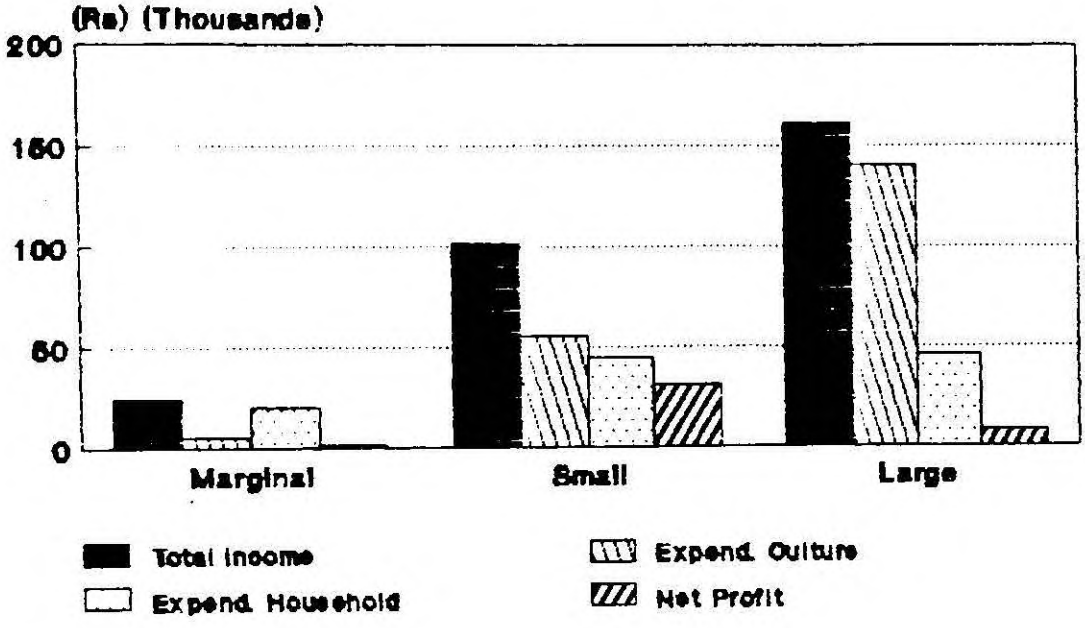


TABLE No.I

COST AND EARNINGS PER ACRE OF FARM AREA

(MARGINAL FARMS)

VARIABLE	COST/ acre (Rs)	COST/FARM (Rs)
Seed	1002.5	531.3
Feed	175.5	93
Labour	1521.1	806.2
Sub-total	2699	1430.5

FIXED ASSETS	COST PER FARM (Rs)
Sluice	2500/-(3½ years) (833.33)
Nets & other Equipments	2120/- (2 years) (1060.20)
Land lease	2087/-
Annual fixed Cost/ Farm	3980

Fixed cost/acre = 7510/-

Total annual operational cost/acre = 10,209/-

Yield = 380.76 Kg.

Value = Rs. 30.43/Kg.

Revenue = Rs. 11586.4

Net Income/acre = 11586.4 - 10,209

= Rs.1377.4

Net Income/Farm of .53 acres = Rs. 730/-

TABLE No. II

COST AND EARNINGS PER ACRE OF FARM AREA

(SMALL FARMS)

Variable	Cost/ acre (Rs.)	Cost/ Farm(Rs.)
Seed	998.4/-	8746/-
Feed	24.9/-	217.8
Labour	1213.6	10631.4
Sub-Total	2236.9	19595.2

Fixed Assets	Cost/Farm (Rs.)
Sluice gates	6030/-(3 yrs.) (2010)
Nets & other Equipments	3080/-(2 yrs.) (1540)
Land lease	32008
Sub-Total	35558/-

Per acre Fixed Cost = Rs. 4059.13

Total annual Operational Cost = 2236.9 + 4059.1

Per acre = 6296/acre

Yield = 312.3 Kg.

Valu = Rs. 31.72/Kg.

Returns per acre = 9906.1

Net profit per acre = 9906.1 - 6296

= Rs. 3610.1/acre

Net income per farm of 8.76 acres = Rs. 31624.5

TABLE No. III

COST AND EARNINGS PER ACRE OF FARM AREA

(LARGE FARMS)

Variable inputs	Cost/ acre (Rs.)	Cost/ Farm (Rs.)
Seed	700.88	23921.2
Feed	15.8	538.4
Labour	938.4	32030.8
Sub-Total	1655.08	56490.40

Fixed Assets	Cost/Farm (Rs.)
Sluice -gate	6050 (3 Yrs) (2016.7)
Nets and other Equipments	3120 (2 Yrs) (1560.0)
Land lease	80,547
Sub-Total	84124

Fixed cost/acre = 2465

Total annual Operational Cost per acre = 4120/-

Yield = 142.23 Kg.

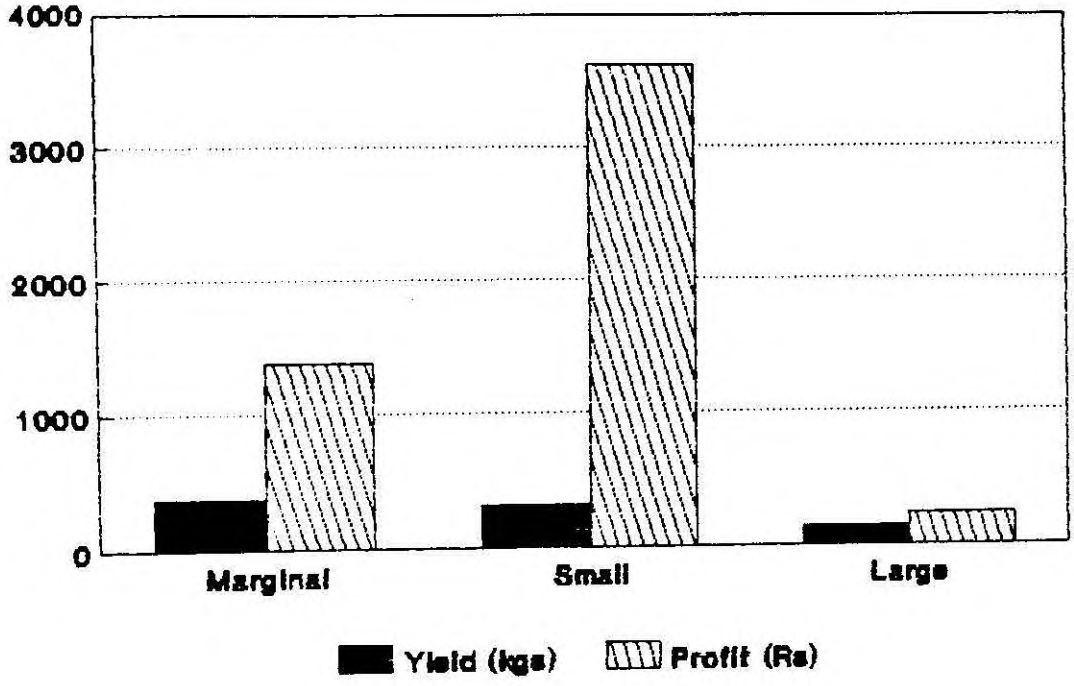
Value = Rs. 30.66/Kg.

Returns = Rs. 4361.4/-

Net Income per acre = Rs. 241/acre

Net Income per farm = Rs. 8225.3/Farm

Average yield and Profit per acre of Different farms



amount of Rs. 4059.1 has been calculated per acre for small farms and Rs. 35558 per farm area. The details on variable and fixed costs in all the three types of farms are shown in Tables I, II & III.

12.Production

Due to more use of inputs on marginal farms the yield per acre was higher than the other two categories. The overall average yield on marginal farm (380.76 Kg) and small farms (312.3 Kg) has been noted more than the average yield of 71 farms (223.54 per acre) whereas on large farms (142.13 Kg) it is less than the average yield. The overall average yields of sample farms is almost of same magnitude as that of Kerala State average for traditional farms.

Regarding marketing of the catch it was noted that the harvested prawns are brought to the prawn peeling sheds for sale.

The price of the prawn is decided based on the count of the prawn per Kg. Some of the farmers take the products to the market.

13. Gross Revenue from Prawn farming

For calculation of Gross Income from Prawn culture, production per farm has been multiplied with the 1 Kg price of prawn. Farm price has been taken to calculate the gross revenue. The overall average income has been calculated at Rs.83,379.3 for an average farm of 11.898 acres. Thus, per acre income is averaged Rs.7007.8. Price realised per Kg. of prawn comes to Rs.31.35. There is no significant

TABLE No. IV

FARM SIZE (ACRE)	YIELD (Kg)	REVENUE (Rs.)	VARIABLE COST (Rs.)	FIXED COST	TOTAL (Rs.)	NET INCOME PER FARM (Rs.)
MARGINAL (0.53)	201.8 (380.76/ acre)	6140.8 (11586.4/ acre)	1430.5 (2699/acre)	3980 (7510/ acre)	5410.5 (10,209/ acre)	730/- (1377.4/acre)
SMALL (8.76)	2735.8 (312.3/ acre)	86777.8 (9906.1/ acre)	19595.2 (2236.9/ acre)	35558 (4059.13/ acre)	55153.2 (6296/acre)	31624.5 (3610.1/acre)
LARGE (34.13)	4854.3 (142.3/ acre)	148853.8 (4361.4/ acre)	56490.40 (1655.08/ acre)	84124 (2465/ acre)	140614.40 (4120/acre)	8225.3 (241/acre)
ALL FARMS	2659.7 (223.54/ acre)	83379.3 (7007.8/ acre)	23024.7 (1935.2/ acre)	38668.5 (3250/ acre)	61693.2 (5185.2/ acre)	21685.7 (1822.6/ acre)

difference in per Kg price of prawns on different types of farms, as indicated in ANOVA Table No.9.

But since there is a significant difference in the productivity and yield between different type of farms, the revenue realised on different farms, per unit of area also significantly differs; as shown in Table No.IV.

For marginal farms, income per acre of farm area averaged Rs.11,586.4 with an prawn price of Rs.30.43 per Kg. In case of small farms for an average area of 8.76 acres the revenue realised amounts to Rs.86,777.8 per farm. Among all the three types of farms price realised per Kg. of farm is highest on small farms Rs.31.728. For an average area of 34.13 acres, the gross income amounts to Rs.1,48,853.8 for large farms and the price realised per Kg of prawn is Rs. 30.66.

For different type of farms a frequency table of income from farming is prepared and presented below.

INCOME RANGE (Rs)	MARGINAL (n=13)	SMALL (n=45)	LARGE (n=13)
Upto Rs.1000	1		
Rs.1001 - Rs.10,000	2	2	
Rs.10,001-Rs.20,000	1	2	
Rs.20,001-Rs.40,000		5	
Rs.40,001-Rs.80,000		13	1
Rs.80,001-Rs.1,20,000		14	4
Rs.1,20,001-Rs.1,60,000		7	2
Rs.1,60,001-Rs.2,00,000		2	4
More than Rs.2,00,000			2

Among marginal farmers about 8% of the families have income upto Rs.1000; 84% between Rs.1001 and Rs.10,000 and 8% between Rs.10,001 and Rs.20,000. In case of small farmers, 4% of the farmers have income between Rs.1001 and Rs.10,000 and also same percentage between Rs.10,001 and Rs.20,000; 11% between Rs.20,001 and Rs.40,000; 29% between Rs.40,001 and Rs.80,000; 32% between Rs.80,001 and Rs.1,20,000; 16% between 1,20,000 and 1,60,000, and 4% between 1,60,001 and 2,00,000. Among large farmers, per family income from prawn farming starts from more than Rs.40 thousand. There are 8% families with an income between Rs.40,001 and Rs.80,000; 31% between Rs.80,001 and 1.2 lakh, 15% between Rs.1,20,001 and Rs.1,60,000; 31% between Rs. 1,60,001 and Rs.2,00,000 and 15% more than Rs.2,00,000.

14. Net Income

The total operational cost for culture period is worked out at Rs.61,693.2 per farm which comes to Rs.5185.2 per acre. Of total cost, variable cost accounts for 37%. The net income per farm averages Rs.21.685.7 (Rs.1822.6/acre). Among the three types of farms studied here, per acre net income is found highest for small farmers (Rs.3610.1) and lowest for large farms (Rs.241.0). The main reason for less net income for marginal farms in comparison to small farms is the comparatively higher fixed costs per unit area. The rent accounted per acre of farm area is less for the large farms. Another factor which counts is

Table-IX Investment, Expenditure, Farm Size, Stocking Density, Yield, Income and Profit from marginal, small, large and all farms on average

Type of Farm	No.of Farm	Fixed Cost (Rs.)	Variable costs (Rs.)				Farm size (acres)	Stocking density (Number)	Yield (kg)	Revenue (Rs.)	Profi (Rs.)
			Seed	Feed	Labour	Total variable costs					
MF	13	3980 (7510/ acre)	531.3 (1002/ acre)	93 (175/ acre)	806.2 (1521/ acre)	1430.5 (2699/ acre)	0.53	16346 (30842/ acre)	201.8 (380.76/ acre)	6140.8 (11586.4/ acre)	730 (1377.4/ acre)
SF	45	35558 (4059.13/ acre)	8746 (9984/ acre)	217.8 (24.9/ acre)	10631.4 (1213.6/ acre)	19595.2 (2236.9/ acre)	8.76	263556 (30086/ acre)	2735.8 (312.3/ acre)	86777.8 (9906.1/ acre)	31624.5 (3610.1/ acre)
LF	13	84124 (2465/ acre)	23921.2 (700.9/ acre)	538.4 (15.8/ acre)	32030.8 (938/ acre)	56490.4 (1655.2/ acre)	34.13	724231 (21219/ acre)	4854.3 (142.3/ acre)	148853.8 (4361.4/ acre)	8225.3 (241/ acre)
All Farms	71	38668.5 (3250/ acre)	10020.4 (842.2/ acre)	235.7 (21.3/ acre)	12750.6 (1071.7/ acre)	23024.7 (1935.2/ acre)	11.90	302641 (25436/ acre)	2659.7 (223.54/ acre)	83379.3 (7007.8/ acre)	21685.7 (1822.6/ acre)

MF - Marginal Farms

SF - Small Farms

LF - Large Farms

that the amount spent on sluice gate is not increasing proportionately with the increase offarm area. Due to very low input use and improper management practises net income per unit of farm area is meagre for large farms. It can safely be concluded that small farms are more economical as compared to large farms and very small farms called 'marginal farms' in this study.

The whole economics of prawn farming including investment expenditure on variable inputs, farm size, stocking density, revenue and net income per farm and per acre are shown in Table No.X.

15. Production Function analysis.

A Cobb-Douglas type of production function has been used for calculating Marginal value productivity of inputs.

$$Y = a \cdot x_1^{b1} \cdot x_2^{b_2}$$

Where Y is revenue from production per farm; x_1 is seed cost and x_2 is labour charges. In the above equation 'a' is a constant and b_1 and b_2 are regression coefficients of x_1 and x_2 respectively. For fitting the equation costs and revenue data from all the 71 farms have been used. Category-wise regression analysis is not projected because the number of sample farms in marginal and large category is not sufficient.

The estimated equation is represented below.

$$Y = 20.3599 \cdot x_1^{0.3572} \quad x_2^{0.4934}$$

Table- X. OPTIMUM LEVEL OF RESOURCES

Labour=Rs.40/manday, Av.Farm Size=11.898 acres, Per Kg Value of prawn=Rs.31.349

No.of items	Variable	Regression Coefficient	Per Farm		Ratio of MVPs to the acquisition cost	Per Farm Maximum Profitable level	Qty.
			Mean value (Rs.)	Qty			
1.	Intercept	20.3599	-		-	-	-
2.	Output (Y)	-	83379.3	2659.72 kg (223.54 kg/acre)	-	Rs.152400 (Rs.12809 per acre)	4861 kg (408.6 kg per acre)
3.	Seed (X_1)	0.3572**	10020.45	302641 (no.) (25436 no. per acre)	2.97	Rs.29761 (Rs.2501.3 per acre)	898852 nos (75546 nos per acre)
4.	Labour (X_2)	0.4934**	12750.6	318.8 mandays (26.8 mandays per acre)	3.22	Rs.41057 (Rs.3450.7 per acre)	1026 man days (86.3 man days per acre)

In this equation, the value of R^2 is calculated at 77%. The regression Coefficients of X_1 and X_2 are statistically significant. The production elasticities indicate percentage change in gross income, for 1% change in respective inputs. If we increase investment on seed by 10% the increase in gross revenue would come to about 4%, at mean level. Similarly 10% increase in Labour charges will add about 5% to the gross revenue.

A. Marginal Value Productivity of Inputs

Since the data relating to revenue and cost of inputs have been fed for regression analysis, the following equation can be used for calculating the ratio of Marginal Value products (MVP_{x_i}) to their acquisition costs P_{x_i}

$$\frac{MVP_{x_i}}{P_{x_i}} = \frac{b_i . \bar{y} . P_y}{\bar{x}_i . P_{x_i}}$$

$$= b_i . \frac{\text{Mean value of Revenue}}{\text{Cost of } X_i}$$

B. Optimum level of Resources

The co-efficients of regression analysis, mean values of revenue obtained from production and cost of inputs and maximum profitable level values are given in table No. X. Taking all the farms, the average revenue is Rs.83,379.3 per farm and the cost of seed and labour is Rs. 100200.45 and Rs.12750.6 respectively. For these values actual quantities used for inputs and resultant output are also calculated. On an average 25,436 number of seeds have been stocked in per acre of farm area

and 318.8 labour mandays have been used per farm which averages 26.8 mandays per acre. The ratio of MVP_s to the acquisition cost is calculated at 2.97 for seeds and 3.22 for labour. On multiplying these values to the average values at respective input costs the optimum level of investment on seed and labour is calculated. The required amount of investment is found to be Rs.2501.3 per acre on seeds and Rs.345017 per acre on labour to generate maximum revenue of 12809 per acre. While analysing in terms of quantities it is found that by employing 86.3 mandays per acre and by stocking 75,546 seeds per acre, an output of 4080.6 kg. acre can be obtained which will result in maximum profit per acre.

The above analysis shows that the important factors of production like seed and labour have been underutilised on sample farms. It is found that these factors of production can be enhanced about 3 to 4 times to get the maximum profitable level. In case of seed there seems to be discrepancy in the data because the suggested number of seeds per acre of area seems to be higher. It is thus suggested that this factor requires further investigations before reaching to any meaningful conclusion. The descripancy may be due to the fact that data was collected based on enquiry and actual observation could not be made in the field.

C. Correlation between different parameters

Correlation matrix has been worked out between all the parameters studied in this survey like farm income, seed cost, feed cost, labour changes, total variable cost house-hold consumption, indebtedness, farm size (acre), stocking density (no per acre) and yield.

When correlations were worked out for all type of farms, including marginal, small and large farms interesting results were obtained. The total amount spent on the variable inputs like seed, feed and labour has a significant effect on the total income but independently only seed cost and labour charges showed direct correlation with farm incomes. This is due to the fact that none of the farmers gave importance to supplementary feeding and even if it was there, only a few of them especially marginal farmers were using the standard and efficient supplementary feeds, due to which the feed cost showed significant relations with costs of labour and total variable cost on marginal farms. However, the feed input in marginal farms is also not efficiently utilised as there was no significant correlation with the farm incomes. The farm income in all the farms, especially in small and large were directly and significantly correlated with the house-hold consumption, indebtedness, farm size, stocking density and the yield. The non-availability and high cost of the market feeds could be the main reason of the reported low feed use.

On marginal farms, seed cost is significantly correlated with total variable cost and stocking density. Feed cost has significant relations with labour and total variable cost. Labour is significantly correlated with total expenditure only.

In marginal farms, the income showed a negative correlation with House hold consumption and Indebtedness. This trend could be due to the fact that as the farm income increase there is a tendency to save and therefore the rate of increase in consumption expenses and indebtedness decrease.

Among large farms, high and negative correlation between the inputs cost except feed, and the farm income remains unexplained. The house-hold expenses increased with increase in farm income and so has the indebtedness. The farm-size also showed a negative correlation with the farm income. The cost incurred on seed showed significant correlation with farm size stocking density and also the yield. The labour charges also increased with increase in total expenditure, farm size, stocking density and yield. The total expenditure had significant correlation with farm size, stocking density and yield in all farms. In large, and marginal farms, the house-hold consumption showed a negative correlation with the total variable costs, whereas the indebtedness has a negative correlation with the total expenditure. The house-hold consumption in small farms showed

TABLE No. V

CORRELATION MATRIX

MARGINAL FARMS n = 13

	FARM INCOME	SEED COST	FEED COST	LABOUR CHARGES	TOTAL VARIABLE COST	HOUSE HOLD CONSUM	INDB	F.SIZE	STD	YIELD
FARM INCOME	1.0									
SEED	0.104	1.0								
FEED	0.459	0.121	1.0							
LABOUR	0.529	0.047	0.946*	1.0						
TOTAL EXP	0.451	0.667	0.798	0.773	1.0					
HOUSE-HOLD CONSUM-PTION	-0.292	-0.391	0.057	0.108	-0.169	1.0				
INDEBT	-0.084	-0.158	0.444	0.387	0.204	0.067	1.0			
FARM SIZE	0.094	0.509	0.026	0.072	0.361	-0.251	-0.474	1.0		
ST.DEN	0.113	0.994*	0.153	0.088	0.692	0.433*	-0.113	-0.546	1.0	
YIELD	0.033*	0.657*	0.343	0.270	0.623	0.043*	0.103	-0.405	0.647*	1.0

* - Significant correlation.

TABLE No.VI

CORRELATION MATRIX

SMALL FARMS

n = 45

	FARM INCOME	SEED	FEED	LABOUR	TOTAL EXPE-NDI	HOUSE-HOLD CONSUMPT	INDEBT	F.SIZE	STOCK DENS	YIELD
FARM INCOME	1.0									
SEED	0.299*	1.0								
FEED	0.007	0.097	1.0							
LABOUR	0.136	0.041	-0.050	1.0						
TOTAL EXPEND	0.300*	0.716*	0.060	0.726*	1.0					
HOUSE-HOLD CONSUMP	0.858*	0.273	-0.044	-0.076	0.132	1.0				
INDEBT	0.410*	-0.068	0.044	-0.152	-0.061	0.444*	1.0			
FARM SIZE	-0.022	0.324*	0.121	-0.235	0.060	0.136	-0.012	1.0		
STOCKING DENSITY	0.163	0.833*	0.028	-0.040	0.543*	0.103	0.031	0.256	1.0	
YIELD	0.835*	0.311*	-0.128	0.098	0.278	0.746*	0.292	0.008	0.273	1.0

* - Significant correlation.

TABLE No.VII

CORRELATION MATRIX

LARGE FARMS

	FARM INCOME	SEED	FEED	LABOUR	TOTAL EXP	HOUSE HOLD CONSU-MPT	INDEBT	FARM SIZE	STOCK DEN-SITY	YIELD
FARM INCOME	1.0									
SEED	-0.286	1.0								
FEED	0.171	-0.125	1.0							
LABOUR	-0.069	0.754*	0.069	1.0						
TOTAL EXP	-0.206	0.955*	-0.030	0.914*	1.0					
HOUSE-HOLD CONSUMPT	0.904*	-0.276	0.156	-1.116	-0.220	1.0				
INDEBT	0.727*	-0.021	0.439	0.377	0.161	0.647*	1.0			
FARM SIZE	-0.462	0.302	-0.268	0.431	0.375	-0.276	-0.110	1.0		
STOCKING DENSITY	-0.428	0.942*	-0.140	0.666*	0.880*	-0.328	-0.143	0.408	1.0	
YIELD	0.986*	-0.328	0.094	-0.128	-0.260	0.940*	0.662*	-0.414	-0.443	1.0

* Significant correlation.

TABLE No.VIII

CORRELATION MATRIX

ALL FARMS

n = 71

	FARM	SEED	FEED	LABOUR	TOTAL EXP	HOUSE CONSUMP	INDEBT	FARM SIZE	STOCK DEN	YIELD
FARM INCOME	1.0	-	-	-	-	-	-	-	-	-
SEED	0.412*	1.0	-	-	-	-	-	-	-	-
FEED	0.214	0.096	1.0	-	-	-	-	-	-	-
LABOUR	0.410*	0.760*	0.181	1.0	-	-	-	-	-	-
TOTAL EXP	0.440*	0.956*	0.156	0.917	1.0	-	-	-	-	-
HOUSE-HOLD CONSUMPTION	0.827*	0.233	0.102	0.157	0.215	1.0	-	-	-	-
INDEBT	0.544*	0.187	0.215	0.228	0.220	0.532*	1.0	-	-	-
FARM SIZE	0.482*	0.654	0.147	0.593	0.669	0.258	0.195	1.0	-	-
STOCK DENSITY	0.371*	0.956*	0.086	0.703*	0.903*	0.195	0.147	0.689*	1.0	
YIELD	0.941	0.426	0.172	0.413	0.449	0.761	0.476	0.536	0.410	1.0

* Significant correlation.

Analysis of Variance

Table-1 (Farm Income) - (Rs.)

	Degrees of Freedom	Mean Square	F-value
Between	2	66902461544	36.812**
Within	68	1817385544	

Table-2 (Cost of Seed)-(Rs.)

	Degrees of Freedom	Mean square	F-value
Between	2	1877809298.458	22.903**
Within	68	81989633.856	

Table-3 (Cost of Feed) - (Rs.)

	Degrees of Freedom	Mean Square	F-value
Between	2	723811.976	NS
Within	68	322912.116	2.242

Table-4 (Cost of Labour) - (Rs.)

	Degrees of Freedom	Mean Square	F-value
Between	2	3444619728.732	** 18.275
Within	68	188488604.704	

Table-5 (House-hold Consumption) - (Rs.)

	Degrees of Freedom	Mean Square	F-value
Between	2	3457823000	** 15.783
Within	68	219079000	

Table-6 (Indebtedness)

	Degrees of Freedom	Mean Square	F-value
Between	2	970591000	** 3.987
Within	68	243423000	

Table-7 (Farm Size)

	Degrees of Freedom	Mean Square	F-value
Between	2	4274.601	** 96.877
Within	68	44.124	

Table-8 (Stocking density)

	Degrees of Freedom	Mean Square	F-value
Between	2	1722439.990	** 24.860
Within	68	69286.943	

Table-9 (Yield)

	Degrees of Freedom	Mean Square	F-value
Between	2	70701939.940	** 48.579
Within	68	1455408.412	

significant correlation with Indebtedness and farm income, whereas the indebtedness showed a negative correlation with farm size. Some of the correlations cannot be explained and could be better explained if the sample size of different farms was sufficiently big. The correlations between different parameters in the three types of farms and all farms are given in tables, V, VI, VII,& VIII.

16. Constraints

1. (a) Relating to Prawn Culture

At Narakkal, prawn culturists are troubled by the water quality problems of the area. Near CIBA at Narakkal, there is a squid processing unit from where the wastes including squid ink are discharged into the feeder canal. This causes oxygen depletion in the water thereby leading to mass mortality of fishes and prawns except a few species of cat fishes. The problem has to be thoroughly studied and checked, otherwise, water exchange to the culture ponds become a serious problem, causing sever loss to the farmers.

b. Although hatchery production of prawn seeds has been perfected, the farmers face the problem of seed availability. Popularisation and incentives to start hatchery by the culturists to make them self-sufficient would be very important for higher and profitable prawn production.

c. Transportation of quality hatchery-reared seeds from distant places is a major constraint. The seeds thus transported may die on introduction into the ponds. So the farmers prefer to buy seeds from the collection centres which collect seeds from the wild.

d. In the farms at Narakkal, pond preparation methods are not carried out in the proper way. Eradication of predators, weeds and uneconomic species is not done before stocking the seeds, with the result that predation of introduced seeds by bigger fishes in the pond remains a major problem is cited by farmers.

e. Soft-shell syndrome is another problem that is prevalent in ponds of Narakkal area. The reason could be attributed to late stocking and the resultant decrease in salinity of the water due to monsoon. However, the exact reason has to be identified and remedy should also be suggested.

f. Feed availability in natural conditions is restricted in a culture pond where stocking density is optimum. In such ponds supplementary feeding becomes a necessity. The feeds available in market like rice bran, oil cakes, clam meat etc. are very costly. An efficient and cheap source of feed should be made available to the farmers.

B. <u>General constraints</u>

a. 'Poaching' is a social problem faced by the farmers. Watch and Ward arrangements are now resorted to, even by

the family members themselves, especially during the second and third months of culture period. "Poaching" has not surfaced as a political issue in Narakkal area according to the farmers.

b. Unemployment or lack of alternate jobs, after the prawn-culture period comes to an end is a major problem that the farmers face which makes it difficult for them to meet the house hold financial requirements. Developing an alternate means of income like Animal husbandry would be beneficial during the off-season.

c. Sanction of loans by the different institutional agencies takes a lot of time and are not adequate enough to meet their requirements.

d. The prawns are sold to the local peeling sheds at Narakkal at different rates based on the counts. Some farmers engage labourers for peeling the prawns and the peeled prawns are sold either to processing units or private buyers. A competitive market as such for the cultured prawns does not exist in Narakkal.

SALIENT FEATURES OF THE STUDY

* To study the socio-economics of prawn farmers a survey was conducted in Narakkal village which is situated in Vypeen Island of Ernakulam District. The majority of the population in this village is by and large poor. The families who are engaged in prawn farming have been identified and divided into the category of small, marginal and large farms based on the size of their respective water-holdings. Some of the farms are growing only prawns whereas others are utilising their farms for paddy cum prawn culture.

* From the study it is revealed that Prawn-farming has infact proved as a major source of income to the coastal rural folk in Narakkal area. Accounting for the profitability of this venture, many well-to-do use their seasonal paddy fields for prawn culture. It is reported that prawn-culture was considered as a poor man's employment earlier. This social constraint has tremendously changed now and the affluent sections of Narakkal population, are engaged in profitable prawn culture.

* The removal of poverty and attainment of self-reliance showed a direct and positive impact on the birth-control. The average family-size was lesser among the richer Sections. Among the poorer families, the profits realised inculcated the tendency to save for

the future and their age-old belief of one mouth-two hands resulting in increase of family-size to extract maximum labour has diminished, showing positive signs of social change. The average family size, 7.7 for marginal farmers 5.5 for small farmers and 5.6 for large farmers.

* Number of persons comprising illiterates and those below the age of 5 years is as high as 21.6% among marginal farmers while among small and large farmers it is only 8.2%.

* Earning members or members in working age group are about 25%, 28.9% and 32.9% in marginal, small and large farmers, while the rest were the dependent members including children and old members.

* The results reveal that there is immense employment potential prawn farming for the local people. Prawn culture provides direct and indirect employment opportunities for the poor and the unemployed youth in the coastal belt.

* The basic amenities available especially to the marginal farmers are generally poor and some of the families had no electricity and water supply in their houses. However hygeinic sanitary conditions, prevailed in almost all the areas surveyed.

* Unscientific beliefs and customs still prevail in Narakkal area like "Mallanu vekkuka" or "Arippodi Kalisam Vekkuka", which is a pooja during which they keep some offerings to Chathan (Devil) near the sluice gate. They offer rice flour, banana, toddy & flowers. It is very common at Narakkal though it is not practised by all farmers in that area.

* Loans are availed from different sources like HDFC, Co-operative societies, commercial Banks, Matsyafed, Private prawn buyers, Friends, Money lenders and relatives. The average loan amounts to Rs.8500 per family, Rs.20000 for small farmers and Rs.25,000 for large farmers.

* An income of Rs.98,000/- is calculated for a family of which prawn farming contributes more than 80% gross returns of Rs.6140, Rs.86777, and Rs.148853/ is worked out for marginal, small and large farms respectively from prawn culture alone.

* The profit realised from prawn farming has raised the consumption levels among the richer families while the consumption and indebtedness showed a declining trend among the poorer families which showed their tendency to save. The marginal farmers had an annual consumption of Rs.19,967 and an indebtedness of Rs.8500, the small farmers spent Rs.45,107 for household consumption and had an indebtedness of Rs. 19,850 per

family whereas the large farmers figured with Rs. 45,292 and Rs. 25,077 respectively on expenditure and indebtedness.

* The yield per acre in marginal farms (380.76 Kg) and small farms (312.3 Kg) were higher than the average yield of all the farmers pooled together (223.5 Kg). The yield on large farms is much less (142.3 Kg) since farm management is very much lacking.

* The costs and returns per acre and per farm of water holding was worked out separately for the three types of farmers. The per acre returns were higher in case of marginal farms. The net profit however was the highest for small farms as compared to marginal and large farms.

* Backwardness in a society in terms of the social, political and economic structure expropriate and channelise benefits to the few at the cost of others. For real development, these structures will have to be shaken which will generate social transformation through education and awareness programme.

* Inspite of technical viability and economic feasibility some of these farmers have failed to meet the social equity and their development needs.

* Aquaculture products, mainly shrimps, are expensive and often beyond the reach of those who toil to produce them and who need it to enhance their nutrition. Generally the products find their way to those who can afford to pay high prices or are exported.

* There is a need for legislative change or enforcement to reserve parts of the coastal zone exclusively for small-scale aquaculture activities, so that coastal communities have opportunity to improve their living conditions.

* In essence, prawn farming should be viewed as yet another rural innovation that will have positive impact on work pattern standard of living incomes, income distribution and infrastructure development. The task of Aquaculture development is to work towards the adoption of scientific systems that bring increased welfare to the community as a whole.

* With the dwindling marine fish resources, the importance and promise of aquaculture have to be recognised while devising economically and socially feasible means of utilising potential resources.

* The appropriate technology transfer has been initiated at Narakkal, to develop productive aquaculture activities and techniques which suits rural conditions and

environment and thus benefits the majority of local residents.

* The overall socio-economic conditions of prawn farmers in the coastal village was poor.

* All the farms were earning profit and the small farms were more economical.

* Yield was not optimum in all the three type of farms due to under utilization of inputs. The optimisation of yield could be effected by increasing the labour inputs and stocking density about three to four times.

* The role of Co-operatives in providing inputs in proper time and quantity is recommended.

* The proper implementation of the technology and its impact has to be assessed from time to time by conducting such socio-economic surveys. The findings will help the planners, industry and the fish farmers.

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APPENDIX - I

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
POST-GRADUATE PROGRAMME IN MARICULTURE
SOCIO-ECONOMICS OF PRAWN FARMERS IN
COASTAL VILLAGES OF ERNAKULAM

(Schedule for the purpose of M.Sc Dissertation)

Village Taluk

PART-1 (GENERAL INFORMATION)

1. Name of the head of the family -

2. Religion and Caste -

3. Details of family

S.No.	Relation-ship	Age (Yrs)	Educational Qualifi-cations	Occupation Main/Sub	Income (Rs) Monthly/ Annual
	Self				
	Wife				
	Sons				
	Daughters				
	Others				

4. Type of house - Hut/Tiled/Concrete

   Owned/Rented -

   Rental value(Rs)-

5. Furniture and other main material objects :

   Radio

   Television

   Refridgerator

   Sofa

   Two-in-one

   Coats

   Others (Specify)

6. No: of family members registered with Co-operative society-

   (Specify name of society also)

Remarks (If any)

PART-2 (SOURCES OF INCOME)

1. Cultivable land holding (ha)-

   Crop raised / Grown Annual production/Revenue

   Annual expenses/Cost of production Net income-

2. Income from animal husbandry

Category	No: of animals	Value (Rs)	Annual Income(Rs)

Remarks (If any)

3. Aquaculture activities

Farm No:	Location	Water area (ha)	Owned/ Leased in/Leased out	Value/ Rent (Rs)	Culture period	Nature of Pond

4. Details of farm labour

Farm No	Labourers	Pond prep	Stocking	Feed/ Fert	Watch	Repair	Harvesting	Marketing
	Family Members							
	Hired Labour							
	Total No: of mandays							
	Total Wages							
	Family Members							
	Hired Labour							
	Total No: of mandays							
	Total Wages							
	Family Members							
	Hired labour							
	Total No. of mandays							
	Total wages							

Total labour charge (For all farms)

Remarks (If any)

5. Assets (Including major equipments)

Items	Quantity/ Number	Construction/ Aquisition year	Prevailing market value	Economic value
Pond				
Sluice Gates				
Water Canals				
Pumps				
Generators				
Feeding Equipments				
Compressor				
Nets				
Others(If any)				

6. Inputs

Items	Name/Source	Total Quantity	Total Cost (Rs)
Seed			
Feed			
Fertilizer			
Fuel/Oil			
Electricity			
H_2O Supply			
Others			

Remarks (If any)

7. Marketing / Transportation Cost

a) Inputs -

b) Outputs -

8. Insurance / Tax etc.

9. Production details

Farm No:	Species	Count No/Kg	Unit price Rs/Kg	Qty sold (Kg)	Consumed/ wasted (Kg)	Value (Rs)

- To whom do you sell your catch

- Terms / Methods of selling

- Other activities

10. Financial assistance

Farm No:	Amt taken as loan (Rs)	Source	Period	Rate of Interest (%)	Purpose

Obligation to creditor (Give details, if any)

Remarks (If any)

PART - 3 (EXPENDITURE PATTERN)

House-hold expenditure

Items	Quantity	Value (Rs)
Oil, Ghee, Milk, and other milk products		
Vegetables		
Eggs, Meat, and Fish		
Sugar		
Salt and spices		
Tea, Coffee, refreshment, Sweets etc		
Clothes		
Foot - wear		
Education		
Tobacco, beedi, Pan		
Drugs, Medicines		
Toilet items (Soap, Cream powder, Tooth-powder, paste, comb, etc)		
Conveyance (Bus, Train, Boat)		
Services (Hair-dressing, Cloth-washing)		
Entertainment (Cinema, Wine, Toddy)		
Rent (House, Boat, Net, Pond, etc)		
Others		

Remarks (If any)

PART - 4 MISCELLANEOUS

Constraints and other information

a.) Problems encountered in the Farm-

b.) Unfavourable price structure

c.) Lack of proper infrastructure

d.) Unavailability of credit

e.) Shortage of credit

f.) Shortage of fry

g.) High level of input prices

h.) Limited market

i.) Lack of extension service

j.) Others (Specify)

2. Suggestions to improve the farm

3. General Remarks:

Enumerator - Ms Beena K.B.